GCSE

BIOLOGY

AQA - COMBINED SCIENCE

MARK SCHEME

B6

INHERITANCE & VARIATION

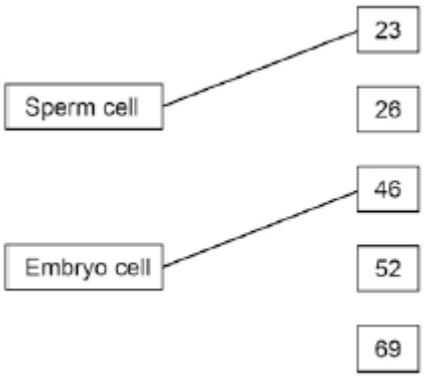
TEST 1

Mark schemes

1 (a) Nucleus

1

(b) **Type of cell** **Number of chromosomes**



extra lines from left cancel the mark

2

(c)

	X	**X**
X	**XX**	**XX**
Y	**XY**	**XY**

*all three correct for **2** marks*
*one or two correct for **1** mark*
allow XY or YX in correct places

2

(d)

	X	X
X	XX	XX
Y	(XY)	(XY)

either circled

1

(e) 1 in 2

1

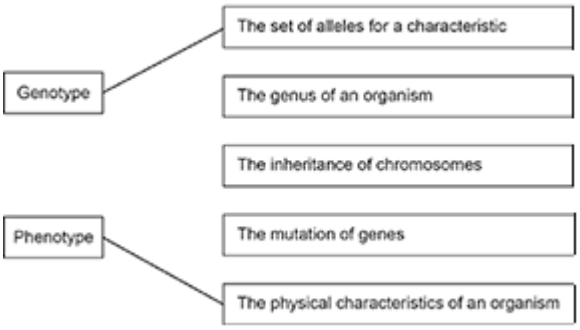
[7]

2 (a)

Characteristic	Environmental	Genetic	Both
Eye colour		✓	
A scar	✓		
Weight			✓

3

(b) **Key term** **Definition**



extra lines from the left negate the mark

2

(c)

Stage in selective breeding	Order of stage
Cows are bred over many generations	4
Parents are bred together	2
Cows with the desired characteristics are chosen	1
Calves with the most desired characteristics are bred together	3

*all 3 correct for **2** marks*

*1 or 2 correct for **1** mark*

max. 2

(d) beef / meat

allow hardiness, disease resistance

1

milk yield

1

(e) higher veterinary costs

1

less income from sale of (milk and meat) products

1

[11]

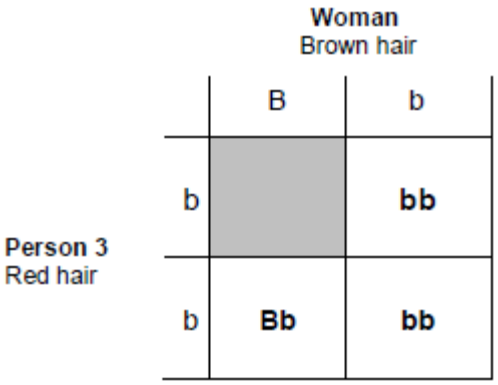
3 (a) When the dominant allele is not present.

1

(b) (i) Bb

1

(ii)



3 correct = 2 marks

2 correct = 1 mark

1 or 0 correct = 0 marks

allow bB for Bb

2

(iii) 1 in 2

allow ecf from part ii

1

[5]

4 (a) same name to everyone

1

(genus) part gives information on ancestry

1

(b) any **one** from:

- DNA / RNA analysis
- improvements to (electron) microscopes
- improved understanding of biochemical processes
- evidence of internal structures being more developed

1

(c) <u>primitive</u> bacteria / prokaryotes

1

(often) from extreme environments / extremophiles

1

[5]

5 (a) organisms that reproduce together to form fertile offspring

1

(b) (i) fossils of **P** and **Q** in same stratum / layer / level / height

1

(ii) earlier − fossil in deeper layer / further down

1

(iii) the fossils of animals **S** and **T** have many features in common, but **T** is more complex that **S**

1

the fossil of animal **S** was found in a deeper layer of rock than the fossil of animal **T**

1

(c) (i) **X** has white tail / shorter tail

*allow other points eg **X** has furrier tail / smaller feet / is furrier*

or

***W** has sharper claws / **W** has larger claws*

1

(ii) two (ancestral) populations separated / isolated (by geographical barrier / by canyon / river)

1

genetic variation (in each population) / different alleles / different genotypes / (different) mutation(s)

1

different environmental conditions / example described

allow abiotic or biotic example

1

the better adapted survive / natural selection occurs

allow survival of the fittest
ignore they adapt to the environment

1

so (different / favourable) alleles / genes passed on (in each population)

1

eventually two types cannot interbreed successfully

allow to produce fertile offspring

1

(iii) any **two** from:

- environments similar / described

  allow example, e.g. similar predator(s) / food / climate
- therefore similar adaptations / features / phenotypes suit

  accept suitable named feature
- original ancestor already well adapted

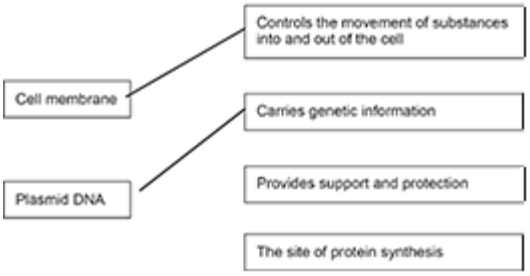
  ignore reference to not enough time for evolution.

2

[14]

6

(a) **Feature** **Function**



extra lines from the left negate the mark

2

(b) Contaminated food

1

(c) any **two** from:

- cook food (thoroughly)
- pasteurise food
- wash hands properly
- disinfect work surfaces
- keep raw and cooked foods separate
- only drink clean water

2

(d) It will not cause sickness and diarrhoea side effects

1

(e) **E**

1

B

1

D

1

[9]

7

(a) cross / breed / mate different breeds of horse

1

if the offspring are fertile then the two breeds are of the same species

1

(b) select the fastest male and female to cross / mate

allow any relevant characteristic, eg stamina

1

select the fastest offspring and breed them

1

repeat over several generations to produce faster horses

1

(c) gene for the Bt poison is cut from the bacterial DNA / plasmid / chromosome

ignore characteristic

accept Bacillus thuringiensis

1

using enzymes(s)

1

and transferred to cotton plant cells / DNA / chromosome

*do **not** allow to cotton plant plasmid*

1

(d) any **four** from:

must have both advantages and disadvantages for full marks

advantages

- increased yield as less eaten by insects
- fewer pesticides need to be used
- (so) producer can make more money

  this point may only be gained if linked to one of the points above

Disadvantages:

- gene (for poison) could be passed on to wild plants
- may kill useful insects

  allow named insect eg bees
- ecosystem / food chain could be affected
- gene pool of cotton plants could be reduced

  allow less variation in cotton plant population

max. 4

[12]

8 (a) testis / testes

allow testicle(s)

1

(b) (i) **B** = 13.2
C = 6.6
E = 3.3

all 3 correct = 2 marks

2 or 1 correct = 1 mark

*If no marks awarded allow ecf for C **and** E based on answer to B*

ie C = ½ B and E = ½ C for one mark

2

(ii) 6.6

*allow twice answer for cell **E** in part bi*

1

(iii) mitosis

correct spelling only

1

(c) (i) any **two** from:
- cells that are able to divide
- undifferentiated cells / not specialised
- can become other types of cells / tissues **or** become specialised /differentiated

allow pluripotent

2

(ii) 4-day embryo is a (potential) human life

or

destroying/damaging (potential) human life

allow cord would have been discarded anyway

ignore reference to miscarriage

allow cannot give consent

1

(iii) perfect tissue match **or** hard to find suitable donors

allow same/matching antigens

allow no danger of rejection

allow no need to take immunosuppressant drugs (for life)

*ignore genetically identical **or** same DNA*

1

(iv) stem cells have same faulty gene / allele / DNA / chromosomes

allow genetically identical

ignore cells have the same genetic disorder

1

[10]

9 (a) any **two** from:

- larger / longer / thicker
  *allow examples eg fewer toes **or** bones fused*
- fewer (bones in total)
  allow smaller surface area touching the ground
- fewer bones touching the ground

2

(b) (i) large(r) surface / area in contact with the ground

or

low / less pressure on ground

1

(so) less likely to sink into mud / ground

or

(so) could run fast(er)
allow easy / easier to escape predators

1

(ii) variation (in size / number / arrangement of bones)
allow mutation(s) (in size / number / arrangement of bones)

1

(and) those with large(r) / few(er) bones more suited to running **or** run faster (on harder / drier ground)

1

these survive **and** breed
allow ref to offspring for breed

1

(so) genes / DNA (for larger / fewer bones) passed on
allow alleles passed on

1

[8]

10 (a) Man's genotpe **Hh**
both needed for the mark

Woman's genotype **hh**

1

(b) gametes correctly derived from parents genotypes in 05.1

1

offspring genotypes correctly derived from gametes

1

all Hh circled

Man's gametes		**Woman's gametes**	
		h	h
	H	Hh	Hh
	h	hh	hh

1

(Probability =) any **one** from:

- 50%
- ½
- 2 / 4
- 0.5
- 1 in 2
- 2 in 4
- 1:1
- 2:2

1

(c) **Level 3 (5–6 marks):**
A detailed and coherent evaluation is provided which considers a range of relevant points and comes to a conclusion consistent with the reasoning.

Level 2 (3–4 marks):
An attempt is made to relate relevant points and come to a conclusion. The logic may be inconsistent at times but builds towards a coherent argument.

Level 1 (1–2 marks):
Discrete relevant points made. The logic may be unclear and the conclusion, if present, may not be consistent with the reasoning.

0 marks:
No relevant content

Indicative content

- adoption / gamete donation unsuitable as offspring not biologically theirs
- natural conception too risky / only 50% chance of healthy offspring
- natural conception would cause worry whether baby would be healthy or not
- (therefore) choice is between PGD and PND

pros of PGD

- baby would be theirs
- results obtained at an early stage
- high chance baby produced would be healthy
- parents would have confidence of having a heathy baby from start of pregnancy
- lower risk of miscarriage compared to PND
- frozen embryos can be used to have another healthy child
- PGD occurs before pregnancy / implantation
- PGD does not involve abortion so less trauma / less pain / ethical comparison
- spare healthy embryos may be used for research / medical treatment

cons of PGD

- slight / 0.2% chance of misdiagnosed embryo
- expensive procedure
- cost to NHS of non-essential procedure
- (unhealthy) embryos might be destroyed
- large number of embryos produced so healthy embryos may be destroyed
- ethical issues of using embryos for research
- some people are opposed to IVF due to their religious beliefs

pros of PND

- natural conception less invasive for mother
- psychological benefit of producing child naturally
- 99% / high chance that result of test will be conclusive

cons of PND

- sampling technique invasive to mother
- risk of miscarriage
- risk of infection
- long wait before test can be carried out
- 50% chance baby will have allele for Huntington's disease
- parents will have a difficult decision to make if baby is unheathly
- baby may be aborted
- ethical / religious issues of abortion
- a justified conclusion

6

[11]